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User's Guide for Tactical Thinking Behaviorally Anchored Rating Scales

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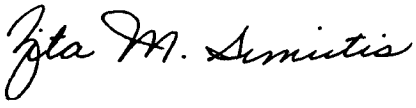

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Product developed under Broad Agency Announcement (BAA) # W74V8H-04-C-0018. An ongoing need exists in the Army to enhance combat leaders' tactical thinking skills. In conjunction, measurement techniques must be developed to assess tactical thinking skills. This product provides a user's guide for using the Tactical Thinking Behaviorally Anchored Rating Scales (T-BARS) to measure an individual's cognitive proficiency in tactical thinking. It describes the use of four scales that enable researchers to measure cognitive proficiency along critical dimensions of tactical thinking by coding behaviors that are observable in the context of training sessions, exercises, or experiments. Themes of tactical thinking identified in the Think Like A Commander program formed the basis of T-BARS. The user's guide provides information on making assessments and establishing interrater reliability.

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USER'S GUIDE FOR TACTICAL THINKING
BEHAVIORALLY ANCHORED RATING SCALES

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USER'S GUIDE FOR TACTICAL THINKING BEHAVIORALLY ANCHORED RATING SCALES

I. Overview

The Tactical Thinking Behaviorally Anchored Rating Scales (T-BARS) are designed to measure an individual's cognitive proficiency in tactical thinking. By cognitive proficiency, we mean an individual's ability to size up a situation, make judgments, and/or decide on courses of action. T-BARS were intended for primary use in training contexts, but they may be of value in other settings as well. The scales are most amenable to training sessions that require individuals to respond to a tactical situation, such as training vignettes, tactical decision games, desktop simulations, and staff or field exercises. *T-BARS enable the evaluator to assess cognition by observing and rating behaviors.*

Phillips, Shafer, Ross, Cox, and Shadrick (2005) describe the process by which the T-BARS were developed. This User Guide is intended to support the application of T-BARS for assessing cognitive proficiency in the tactical thinking domain.

Boundary Conditions

The following boundary conditions apply:

- Level. T-BARS is intended to measure individual performance. It is not intended to measure team or unit performance.
- Domain. T-BARS is intended for use with military personnel in the combat arms/ground combat domains. It is not intended for any other domains.
- Rater qualifications. T-BARS is intended for use by researchers or training professionals who at a minimum have an intermediate understanding of the nature of applied cognition and are familiar with the combat arms domain. It is also intended for military instructors who at a minimum have extensive knowledge of tactical decision making and have experience assessing or examining learners' thought processes during tactical exercises.
- Use settings. T-BARS is intended for scenario-based, experiential training sessions requiring sensemaking and/or decision making, including paper-and-pencil vignette training; tactical decision game or decision making exercise sessions; electronic vignette or decision making exercise sessions; sandtable exercises; desktop simulations or game-based trainers; commander and staff planning or execution exercises; field exercises; tactical exercises without troops; or live fire exercises. It can also be used in the context of advanced technology experimentation where participants (e.g., combat leaders) attempt to apply the technology in the context of a tactical problem. These settings may include examination of net-centric, battle command technologies or examination of battlefield visualization technologies. T-BARS is intended for use in tactical situations with a focus on either planning or execution. It is not intended for classroom lecture sessions or for training sessions focusing on execution of specific tactics or procedures—for example, practice implementing a four-man stack or a standard room clearing operation. It is also not

intended for training for physical rather than thinking skills (e.g., weapons usage training).

- Nature of data to be rated. T-BARS is intended for verbal protocol data that includes the individual's reasoning behind decisions and judgments; written responses to tactical exercises, especially courses of action and accompanying rationale; and observations during tactical planning or execution exercises. It is not intended for multiple choice or short answer test data.

Organization of the User Guide

The remainder of this User Guide is organized as follows:

Section II describes the theoretical foundations of the T-BARS by discussing the role of mental models in cognitive performance and the manner by which the T-BARS attempt to measure mental model maturity in the tactical thinking domain.

Section III provides instructions for using the T-BARS in assessment, from collecting suitable data to code with T-BARS to scoring the ratings to produce a cognitive profile for the individual who has been assessed.

Section IV, Establishing Interrater Consensus, provides recommendations for establishing consensus between raters using T-BARS in the same or similar settings.

Section V contains the T-BARS assessment tool.

II. The Role of Mental Models

The T-BARS assessment tool is organized according to a set of tactical mental models. Mental models are internal representations of the external world. They are the mental representations that encode an individual's unique knowledge gained from experience. Mental models support understanding, reasoning, prediction, and action. Mental models are domain specific—they encapsulate how things work in a particular domain. For leaders in combat arms domains, four categories distinguish the mental models that are thought to be primarily responsible for performance[1]. These four categories form the structure of the T-BARS:

- **Know and Use All Assets Available (*Assets*)**. Combat leaders must maintain awareness of the synergistic effects of fighting their command as a combined arms team. This includes not only all assets under their command, but also those which higher headquarters might bring to bear to assist them.

- **Focus on the Mission and Higher's Intent (*Mission*)**. Combat leaders must stay aware of the higher purpose and the results they are directed to achieve. Even when unusual and critical events may draw them in a different direction, it is essential to stay focused on the overall mission.

- **Model a Thinking Enemy (*Enemy*)**. Combat leaders must remember that the adversary is a reasoning human being who is intent on defeating friendly forces. Although it is tempting to simplify the battlefield by treating the enemy as static or simply reactive, this will harm the troops' ability to fight an effective battle.

- **Consider Effects of Terrain (*Terrain*)**. Combat leaders must not lose sight of the operational effects of the terrain on which they must fight. Every combination of terrain and weather has a significant effect on what can and should be done to accomplish the mission.

T-BARS is structured around these four mental models because performance on cognitive tasks (such as sensemaking and decision making) depends on the accuracy and maturity of one's mental models. In scoring an individual's developmental stage for each of the mental models, we have a metric of overall cognitive proficiency.

General Stages of Mental Model Development

Prior to implementing T-BARS, it is critical to understand the constructs of the scales. A five-point scale has been developed for each of the aforementioned mental models. The five points on each scale represent five levels or stages of proficiency, based on the Dreyfus & Dreyfus (1986) model of cognitive skill acquisition. The cognitive profiles for each level, including characteristics of knowledge and performance, are as follows:

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[1] The four mental models for tactical thinking were identified in the Think Like A Commander program of research and training. For more information, see Lussier (1998), Lussier, Shadrick, and Prevou (2003), Phillips, Shafer, Cox, Ross, & Shadrick (2005), and Ross, Phillips, Klein, & Cohn (2005).

Stage 1: Novice

Individuals who perform at the Novice level have limited or no experience in situations characteristic of their domain. They are typically taught about the situations they will encounter in terms of objective "attributes" such as the number of Soldiers in a unit, the range radius of enemy assets, or other measurable quantities that can be recognized without operational or exercise experience. Novices are also taught context-free rules, such as the formula for determining how long it will take personnel carriers to get from point A to point B under normal conditions. Because the Novice's understanding of the domain is based largely in rules, his or her performance is quite limited and inflexible. As the study of nursing by Benner (1984) points out, rule-guided behavior actually prevents successful performance because a set of rules cannot make clear which tasks are relevant or critical in an actual situation.

A Novice under the Dreyfus and Dreyfus model may have a great deal of textbook or classroom knowledge of the domain, but what places him or her in Stage 1 is the shortage of actual lived experience. There is a clear distinction between the level of performance that results when textbook principles and theories are applied and the superior performance achieved when an experience base guides performance. Table 1 summarizes the characteristics of Novices.

Table 1

Stage 1: Novice

STAGE 1: NOVICE	
General Characteristics	
Knowledge	***Performance***
▪ Objective facts and features of the domain (Dreyfus & Dreyfus, 1986). ▪ Context-free (abstract) rules to guide behavior (Dreyfus & Dreyfus, 1986). ▪ Domain characteristics acquired through textbooks and classroom instruction (Benner, 1984).	▪ Guided by rules; is limited and inflexible (Benner, 1984). ▪ Shows recognition of elements of the situation without considering context (Dreyfus & Dreyfus, 1986). ▪ Is variable and awkward (Glaser, 1996). ▪ Focuses on isolated variables (Glaser, 1996). ▪ Consists of a set of individual acts rather than an integrated strategy (Glaser, 1996; McElroy de Chesnay , & Greiner, 1991). ▪ Is self-assessed based on how well he adheres to learned rules (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ Reflects a sense of being overwhelmed since all stimuli are perceived to be equally relevant (McElroy et al., 1991).

Stage 2: Advanced Beginner

Advanced Beginners have acquired enough domain experience that their performance can be considered marginally acceptable. At this stage, learners can recognize, either on their own or when pointed out to them by an instructor, recurring meaningful "aspects" of the situation. Aspects are global characteristics that are identifiable only through prior experience; the prior experience serves as a comparison case for the current situation. For example, an Advanced Beginner would be able to grasp that close air support could be helpful in a particular situation after taking part in a previous exercise in which close air support was utilized. A learner at this stage would not know how, when, or where to employ the air assets to the best advantage, but would recognize their potential to help alleviate the situation.

While it is possible to make some of these aspects explicit for a domain, it is not possible to form objective rules to govern every situation. Building on the close air support example, it is likely that a different array of factors would determine the applicability of air assets for different situations. A single set of well-defined rules cannot adequately address every instance. With experience, the learner will increasingly pick up on the array of cues that signal opportunities for air support.

Advanced Beginners have a set of attributes and aspects in their repertoire with which to guide their performance. At this stage they can begin to develop their own "guidelines" that stem from an understanding of the domain attributes and aspects. Guidelines are rules of thumb that inform behavior by allowing the practitioner to attach meaning to elements of a situation (Dreyfus & Dreyfus, 1980; 1986). For example, a platoon leader at this level of proficiency may know that the first step in conducting an offensive is to set up a base of fire, and he may know that the support position should be a certain distance from the primary objective. However, he may not understand that he needs to take into account not only distance from the objective, but also angles of fire, to prevent fratricide. And he probably cannot distinguish that the rules and factors critical under one set of circumstances are not necessarily decisive in other operational situations. Spiro et al. (1992) note that in complex domains, the application of different patterns of principles varies from situation to situation, and there is substantial interconnectedness among principles. At this stage the practitioner has organized his or her knowledge and experience into principles, but has not built the interconnectedness or developed the ability for flexible application. Table 2 summarizes the characteristics of Advanced Beginners.

Stage 3: Competent

Stage 3 is marked by the ability to formulate, prioritize, and manage longer-term goals or objectives. This perspective gives the operator a better sense of the relative importance of the attributes and aspects of the situation. The transition from Advanced Beginner to Competent is highlighted by a shift from highly reactive behaviors, where actions are taken right when a problem surfaces, to more planned behaviors, where the learner can see the larger picture and assess what actions must be taken immediately and what can wait until later. While a learner at Stage 3 is not as quick or flexible as a Stage 4 learner, he or she can typically manage a large set of incoming information and task demands.

Table 2

Stage 2: Advanced Beginner

STAGE 2: ADVANCED BEGINNER	
General Characteristics	
Knowledge	***Performance***
▪ Some domain experience (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ More objective, context-free facts than the novice, and more sophisticated rules (Dreyfus & Dreyfus, 1986). ▪ Situational elements, which are recurring, meaningful elements of a situation based on prior experience (Dreyfus & Dreyfus, 1986). ▪ A set of self-generated guidelines that dictate behavior in the domain (Benner, 1984). ▪ Seeks guidance on task performance from context-rich sources (e.g., experienced people, documentation of past situations) rather than rule bases (e.g., textbooks) (Houldsworth, O'Brien, Butler, & Edwards, 1997).	▪ Is marginally acceptable (Benner, 1984). ▪ Combines the use of objective, or context-free, facts with situational elements (Dreyfus & Dreyfus, 1986). ▪ Ignores the differential importance of aspects of the situation; situation is a myriad of competing tasks, all with same priority (Benner, 1984; Dreyfus & Dreyfus, 1986; Shanteau, 1992). ▪ Shows initial signs of being able to perceive meaningful patterns of information in the operational environment (Benner, 1984). ▪ Reflects attitude that answers are to be found from an external source (Houldsworth et al., 1997). ▪ Reflects a lack of commitment or sense of involvement (McElroy et al., 1991).

The Competent performer acts on the situation with a very analytical, hierarchical approach. Dreyfus and Dreyfus (1986) compare this to the problem-solving approach described by proponents of information processing. Based on an initial judgment of what part of the situation is most important, the performer generates a plan to organize and thus simplify the situation to improve his performance. However, the drawback for Competent performers is that their plans drive their behavior to a greater extent than any situational elements that may arise; they tend to hesitate to change their plan mid-course, despite the introduction of new, conflicting information. Simultaneously, Competent performers are more emotionally invested in their performance than Novices or Advanced Beginners. Because they actively choose a plan of action for themselves rather than relying on rules offered by a textbook or instructor, they take great pride in success and are distressed by failure. Table 3 summarizes the characteristics of Competent individuals.

Table 3

Stage 3: Competent

STAGE 3: COMPETENT	
General Characteristics	
Knowledge	***Performance***
▪ How to think about the situation in terms of overarching goals or tasks (Benner, 1984). ▪ The relative importance of subtasks depending on situational demands (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ Particular patterns of cues suggest particular conclusions, decisions, or expectations (Dreyfus & Dreyfus, 1986). ▪ A personalized set of guiding principles based on experience (Houldsworth et al., 1997). ▪ How to anticipate future problems (Houldsworth et al., 1997).	▪ Is analytic, conscious, and deliberate (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ Does not rely on a set of rules (Houldsworth et al., 1997). ▪ Is efficient and organized (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ Is driven by an organizing plan that is generated at the outset of the situation (Dreyfus & Dreyfus, 1986). ▪ Reflects an inability to digress from the plan, even when faced with new, conflicting information (Dreyfus & Dreyfus, 1986). ▪ Reflects an inability to see newly relevant cues due to the organizing plan or structure that directs attention (Benner, 2004). ▪ Reflects an emotionally involved performer who takes ownership of successes and failures (Dreyfus & Dreyfus, 1986). ▪ Focuses on independent features of the situation rather than a synthesis of the whole (Houldsworth et al., 1997).

Stage 4: Proficient

Learners at the Proficient level have moved away from perceiving situations in terms of independent aspects and attributes and see the situation as an inseparable whole where aspects and attributes are interrelated and woven together. The situation is not deliberately analyzed for its meaning; an assessment occurs automatically and dynamically because the learner has an extensive experience base from which to draw comparisons. However, decisions regarding appropriate actions continue to require some degree of detached analysis and deliberation. With regard to the situation assessment process, Proficient individuals experience the event from a specific perspective with past experiences in mind. Therefore, certain features of the situation stand out as salient, and others fade into the background as non-critical. This is in keeping with findings from the naturalistic decision making research that as individuals gain more experience, they are quickly able to recognize critical cues and patterns of cues (e.g., Crandall & Getchell-Reiter, 1993; Hoffman, Crandall, & Shadbolt, 1998; Klein, 1998). Dreyfus and Dreyfus (1986) assert that at this stage, performers are also positively impacted by new information that is obtained as the situation progresses. While Competent performers generally cannot change their plans when faced with conflicting information, Proficient individuals fluidly adjust their plans,

expectations, and judgments as features of the situation change. They have an intuitive ability to recognize meaningful patterns of cues without breaking them down into their component parts for analysis. Dreyfus terms this ability "holistic similarity recognition." However, the elements that are holistically recognized must still be assessed and combined using sophisticated rules in order to produce a decision or action that meets the individual's goal(s).

Dreyfus and Dreyfus (1986) further describe Stage 4 performers as being guided by "maxims" which reflect the nuances of a situation (see also Benner, 1984). These maxims can mean one thing under one set of circumstances, but something else under another set of circumstances. As a simplistic example, consider a building in the midst of an urban combat area whose windows are broken out. This cue could indicate that the building is run down and vacant. It could also indicate that the adversary is occupying the building, and has broken out the windows to use it as a base of fire. Other situational cues and factors will need to be considered to determine how to interpret the broken out windows—for example, the adversary's history of breaking out windows, typical building types that he has utilized in the past, his last known location and projected current location, the presence or absence of undisturbed dust or dirt around the building, and so forth.

While Proficient individuals can make note of the maxims or nuances, they may not yet be able to reliably use the maxim to decide on an action. Following the example of the broken out windows, a Proficient platoon leader may know to be concerned about the enemy's presence in the building, but may lack the experience base to integrate the situational cues and factors and then accurately and confidently assess what is actually happening in the building. As a result, he may be unable to adjust his plan to effectively handle the building. Table 4 summarizes the characteristics of Proficient performers.

Table 4

Stage 4: Proficient

STAGE 4: PROFICIENT	
General Characteristics	
Knowledge	***Performance***
▪ Typical "scripts" for categories of situations (Klein, 1998). ▪ How to set expectancies and notice when they are violated (Benner, 1984). ▪ How to spot the most salient aspects of the situation (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ Personalized maxims, or nuances of situations, that require a different approach depending on the specific situation, but not how to apply the maxims correctly (Benner, 1984; Houldsworth et al., 1997).	▪ Reflects a perception of the situation as a whole rather than its component features (Benner, 1984). ▪ Is quick and flexible (Benner, 1984). ▪ Reflects a focus on long-term goals and objectives for the situation (Benner, 1984). ▪ Utilizes prior experience (or intuition) to assess the situation, but analysis and deliberation to determine a course of action (Dreyfus & Dreyfus, 1986; McElroy et al., 1991). ▪ Reflects a synthesis of the meaning of information over time (Benner, 2004). ▪ Reflects a more refined sense of timing (Benner, 2004).

Stage 5: Expert

The fifth and final stage of the Dreyfus and Dreyfus (1986) model is Expertise. At this level, the individual no longer relies on analytic rules, guidelines, or maxims; performance becomes intuitive and automatic. The Expert immediately understands which aspects of the situation are critical and does not waste time on the less significant aspects. He or she knows implicitly what action to take and can remedy a situation quickly and efficiently. Table 5 summarizes the characteristics of Experts.

Table 5

Stage 5: Expert

STAGE 5: EXPERT	
General Characteristics	
Knowledge	***Performance***
▪ How to make fine discriminations between similar environmental cues (Klein, 1993). ▪ How to intuitively assess the situation (Benner, 2004; Dreyfus & Dreyfus, 1986). ▪ How to respond to maxims or nuances based on the unique array of cues and factors in the situation (Benner, 2004). ▪ How to intuitively respond to the situation (Benner, 1984; Dreyfus & Dreyfus, 1986). ▪ How tasks and subtasks are supposed to be performed (Phillips, Klein, & Sieck, 2004). ▪ How equipment and resources function in the domain (Phillips et al., 2004). ▪ How to perceive meaningful patterns in large and complex sets of information (Klein, 1998; Dreyfus & Dreyfus, 1986). ▪ What is typical and atypical for a particular situation (Dreyfus & Dreyfus, 1986; Feltovich, Johnson, Moller, & Swanson, 1984; Klein, 1999). ▪ A wide range of routines or tactics for getting things done (Klein, 1999). ▪ More facts about the domain than less proficient individuals (Phillips et al., 2004). ▪ A huge library of lived, distinguishable experiences that impact the handling of new situations (Dreyfus & Dreyfus, 1986). ▪ How to set expectancies and notice when they are violated (Benner, 1984).	▪ Is fluid and seamless, like walking or talking; "integrated rapid response" (Benner, 1984, 2004; Dreyfus & Dreyfus, 1986). ▪ Is based on prior experience for both assessment and decision making (Dreyfus & Dreyfus, 1986). ▪ Is automatic, and the rationale for actions is often difficult to articulate (Benner, 1984). ▪ Relies heavily and successfully on mental simulation to predict events, diagnose prior occurrences, and assess courses of action (Einhorn, 1980; Klein & Crandall, 1995). ▪ Consists of more time assessing the situation and less time deliberating a course of action (Lipshitz & Ben Shaul, 1997). ▪ Shows an ability to detect problems and spot anomalies early (Feltovich et al., 1984). ▪ Capitalizes on leverage points, or unique ways of utilizing ordinary resources (Klein & Wolf, 1998). ▪ Reflects use of innovations and new possibilities for responding to particular situations (like leverage points) (Benner, 2004). ▪ Manages uncertainty with relative ease by filling gaps with rational assumptions and formulating information-seeking strategies (Klein, 1998; Serfaty, MacMillan, Entin, & Entin, 1997). ▪ Reflects metacognitive skill, or the ability to self-monitor (Chi, 1978; Chi, Feltovich, & Glaser, 1980; Larkin, 1983; Simon, 1975). ▪ Shows efficient information search activities (Shanteau, 1992).

Progression of Tactical Thinking Mental Model Development

Within each of the four mental models, individuals begin their careers at Level 1 as they learn rules and procedures in classroom settings. As they have the opportunity to apply the rules they have learned in training exercises (and possibly real-world operations) they gradually progress up the scale. As they continue to experience an increasingly greater set of operational circumstances that give them the opportunity to practice making decisions and judgments, they move toward the high end of the scales. Actual combat experience will typically enable an individual to progress to Levels 4 and 5 much more quickly than he or she would otherwise.

Looking across the four mental models, it is hypothesized that the mental models follow a particular developmental order. The rows in Figure 1 show the four mental models with the descending order representing the progression of their development. Knowledge of friendly assets (*Assets* mental model) and a focus on the mission (*Mission* mental model) seem to develop first. As individuals enter the domain, they work to grasp the "tools" they have to influence situations and determine how they can apply the assets to tasks. Once learners have a basic understanding of the assets at their disposal and common mission tasks and objectives, they start to consider the enemy as an active component of their planning and execution (*Enemy* mental model). In other words, it appears to be prohibitively difficult to consider the role of an opponent or adversary before comprehending ones own function on the battlefield. Finally, we suspect individuals initiate development of their *Terrain* mental model once they have a foundation in the first three. Terrain represents physical features of the environment in which the learner applies his own assets, conducts mission tasks, and imagines the enemy's moves. Meaning cannot be attributed to terrain features without the context provided by the former three mental models, and mental models do not develop without contextualized meaning.

Note that learners do not have to master a particular mental model before the next one can begin to take shape. Rather, a foundation must exist within the early developing mental models before the later ones can form. For example, we have seen that individuals who lack a sense of how to employ their own assets rarely have the ability to comprehend how terrain features impact mobility, prevent lines of sight, or present danger areas like choke points. What is not clear is the extent to which a foundation must be developed within the early developing mental models before the later ones can begin to develop.

Furthermore, four additional aspects of tactical thinking are hypothesized to develop when combat leaders are in the advanced stages of tactical mental model development. These additional components include the following:

- **See the Big Picture *(Big Picture)***. This theme refers to the importance of maintaining awareness of what is happening in the environment and how it might affect operations—what courses of action can affect others' operations. A narrow focus on one's own fight can get you blind-sided.

- **Consider Timing (*Timing*)**. The focus of this theme is on the importance of being cognizant of the time available to get things done. A good sense of how much time it

takes to accomplish various battlefield tasks and the proper use of that sense is a vital combat multiplier.

- **Consider Contingencies and Remain Flexible** ***(Contingencies)***. Combat leaders must never lose sight of the old maxim that "no plan survives first contact with the enemy." Flexible plans and well thought out contingencies result in rapid, effective responses under fire. Contingencies are characterized by thinking that begins with questions like "What if...?" or "How else can I...?"

- **Visualize the Battlefield** ***(Visualize)***. Leaders must be able to visualize a fluid and dynamic battlefield with some accuracy and use this visualization to their advantage. A leader who develops this difficult skill can reason proactively like no other.

These four components are seen as cognitive processes or mental manipulations of the four mental models. They are exhibited by experienced, proficient, combat decision makers. Leaders conduct these higher order mental operations in the context of the four basic mental models. For example, an experienced tactician can estimate how long it will take to move a bridging asset from one point to another (*Timing* in the context of *Assets*) or predict what the enemy will attempt as the situation plays out (*Visualization* in the context of *Enemy*). Accordingly, the columns in Figure 1 represent development of skill in these four cognitive processes around Levels 4 and 5 of mental model development.

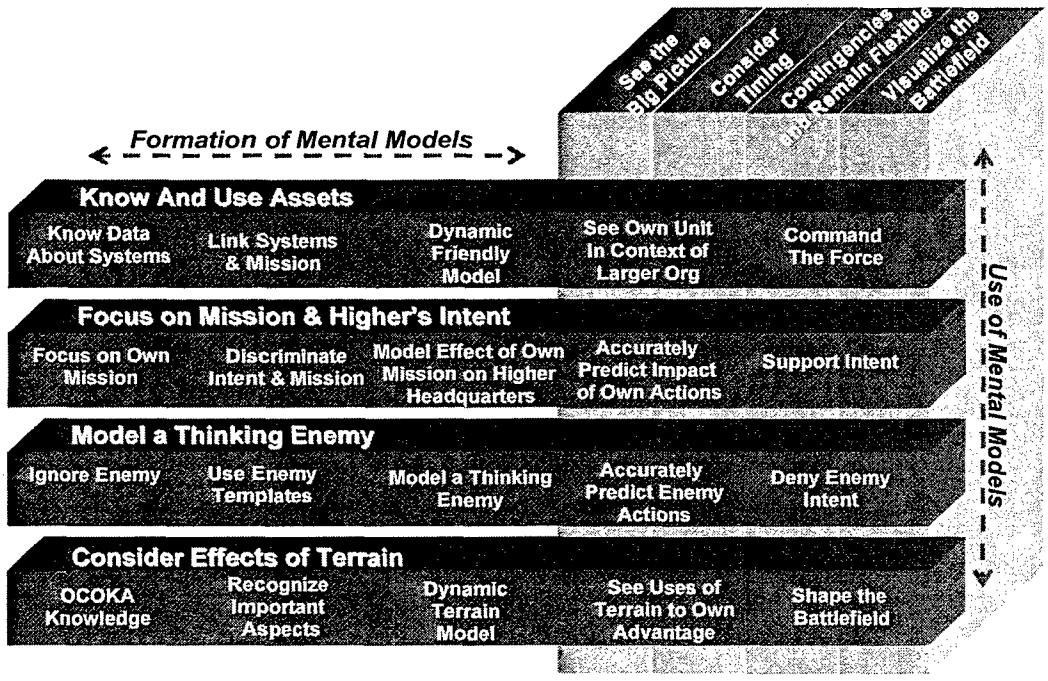

Figure 1. Hypothesized developmental sequence of tactical mental models and cognitive processes.

Cognitive Profiles for the Tactical Thinking Mental Models

The following section outlines the cognitive profiles for each level of the four tactical thinking mental models.

Know and Use All Assets Available

Level 1: Knows textbook capabilities. Performance is abstract and rule-based, and focuses on variables in isolation. Individual knows facts about standard capabilities of organic assets such as ranges of weapons, number of vehicles per unit, and so forth. The foundational knowledge required to analyze how assets can be applied to the situation has not yet developed.

Level 2: Matches assets to mission requirements. Performance reflects simple analytical processing using a limited experience base. Organic assets are matched to mission requirements. For example, a tank formation would be allocated to the area where heavy armor is needed for protection. Individual has difficulty prioritizing tasks, so asset utilization is driven by capabilities (what the asset can do) over situational demand (what is the most pressing mission task).

Level 3: Utilizes organic assets to accomplish mission objectives. Performance reflects a mental model of asset utilization, but remains dependent on analysis and planning rather than recognition and intuition. Individual can prioritize mission tasks and predict how the situation could unfold, and an asset utilization plan is generated against that analysis. However, execution is driven by the plan over the situation, so the individual has difficulty adjusting asset utilization to meet changing situational demands.

Level 4: Recognizes full range of assets required based on situational demands. Performance reflects a recognitional or intuitive assessment of the situation, but analytical decision making where the individual deliberates about a course of action. Individual recognizes the availability of non-organic and non-military assets in addition to his own organic assets. For example, civilians are recognized to be valuable sources of human intelligence (HUMINT). Situational demands drive asset utilization, rather than the plan or the organic assets at the individual's disposal.

Level 5: Applies full range of assets to direct the outcome of the battle. Performance reflects a recognitional ability to assess and decide. Individual can visualize specific outcomes of asset utilization and has the ability to avoid unwanted consequences. For example, he knows how to command and maneuver his forces to avoid an uprising by the locals. Individual leverages and coordinates organic, non-organic, and non-military assets to achieve mission objectives.

Focus on the Mission and Higher's Intent

Level 1: Focuses on own mission. Performance is abstract and rule-based, and focuses on variables in isolation. Individual fixates on own mission rather than considering larger organization's mission. He is unable to consider higher intent. The foundational knowledge required to analyze steps necessary for mission accomplishment has not yet developed.

Level 2: Discriminates intent and explicit mission. Performance reflects simple analytical processing using a limited experience base. Mission tasks are paramount to all else, and intent can be articulated but not operationalized. Individual has difficulty prioritizing tasks for mission accomplishment and is often uncertain or overwhelmed as the situation evolves. There is a tendency to rely on direction from higher headquarters (HQ) rather than making own decisions.

Level 3: Models effects of own mission and HQ intent. Performance reflects a mental model of how intent is achieved through mission tasks, but remains dependent on analysis and planning rather than recognition and intuition. Individual can prioritize mission tasks and predict how the situation could unfold, and a course of action is generated based on that analysis. However, performance in execution is guided by an efficient but rigid plan that is not adapted to account for changes in the situation.

Level 4: Makes accurate predictions. Performance reflects a recognitional or intuitive assessment of the situation, but analytical decision making where the individual deliberates about a course of action. Individual recognizes how situational factors impact the mission and the path to achieving intent. For example, he can visualize the enemy's likely objective and use of terrain, and he uses that assessment to deliberate about how to support the intent through his own mission. During execution, changes in the situation are recognized intuitively, and mission tasks are adapted or changed to continue to support intent.

Level 5: Supports intent. Performance reflects a recognitional ability to assess and decide. Individual can quickly and accurately assess the situation, visualize contingencies, and devise an action plan that accomplishes the intent while avoiding unwanted 2nd and 3rd order consequences. Individual operates from a big picture perspective in which he takes actions that support the short- and long-term objectives of the coalition force.

Model a Thinking Enemy

Level 1: Uses enemy templates. Performance is abstract and rule-based. Individual acknowledges enemy superficially and equates him with theoretical or doctrinal templates learned in schoolhouse—for example, the typical Soviet offensive formation. The foundational knowledge required to analyze probable enemy actions and objectives has not yet developed.

Level 2: Regards enemy as static. Performance reflects simple analytical processing using a limited experience base. Enemy is understood to have an impact on the mission, but is regarded as a static, non-thinking adversary. Individual has trouble distinguishing enemy centers of gravity from the rest of the enemy picture. Individual struggles to make sense of or draw hypotheses about the enemy's objectives.

Level 3: Regards enemy as intelligent and dynamic. Performance reflects a mental model of an intelligent, dynamic enemy. Individual analyzes the enemy situation and predicts enemy actions in order to formulate an efficient and organized course of action (COA) that defeats the enemy. Ideas about the enemy's objectives and COA are constructed, but they are

general and imprecise. Because the individual is guided by the plan rather than situational demands, he struggles to adapt his COA when the enemy situation changes during execution.

Level 4: Predicts enemy actions. Performance reflects a recognitional or intuitive assessment of the enemy's objective and intent, but analytical decision making where the individual deliberates about a course of action that defeats the enemy. Individual continually updates his assessment of the enemy situation and his predictions about the enemy's next steps based on situational factors.

Level 5: Denies enemy intent. Performance reflects a recognitional ability to assess and decide. Individual visualizes how enemy will act and react, and takes actions to deny enemy intent. For example, he recognizes enemy leverage points and takes action to neutralize them or make them unavailable.

Consider Effects of Terrain

Level 1: Uses terrain checklists. Performance focuses on identifying discrete features of terrain. Individual uses standard checklists to determine relevant terrain features. The foundational knowledge required to analyze the impact of terrain on the mission has not yet developed.

Level 2: Identifies important terrain features. Performance reflects simple analytical processing using a limited experience base. Important terrain features are identified and prominent problem areas such as chokepoints are avoided. However, individual remains unable to leverage terrain to own advantage.

Level 3: Incorporates terrain into own plan. Performance reflects a mental model of the impact of terrain on the mission. Individual performs an analysis of the terrain and incorporates terrain features into the plan. For example, in an urban setting the tallest and sturdiest buildings are perceived as good locations to occupy. However, the individual tends to adhere to the plan even after the situation has evolved and new information about the terrain becomes available.

Level 4: Recognizes how the enemy may use terrain. Performance reflects a recognitional or intuitive assessment of the aspects and patterns of terrain that are critical for friendly and enemy forces but deliberate analysis of how to utilize the terrain to accomplish the mission. Individual continually updates his view of the terrain and its impact on the mission as the situation evolves and new terrain features and patterns are discovered.

Level 5: Turns terrain to own advantage. Performance reflects a recognitional ability to assess and decide. Individual is quickly able to visualize how terrain will impact the friendly mission and predicted enemy actions. He leverages the terrain to his own advantage and denies the enemy's ability to do the same.

Using the T-BARS Assessment Tool

The T-BARS assessment tool will enable you to judge the current state of an individual's tactical mental models. It provides a means to measure improvement over time and as a result of training interventions. An individual's profile and score has implications for appropriate next steps in his/her training cycle. When measured in the context of examining battle command technologies, an individual's profile can provide an understanding of what the system contributes to his or her cognitive process.

To conduct an assessment with T-BARS, it is critical to have a thorough data record with which to score behaviors. We have identified three sources of performance data: verbal protocols, written responses, and observations.

Utilization of a verbal protocol is likely the best approach for capturing a thorough record of performance for an individual. In contrast to using written responses, a researcher implementing a verbal protocol has more control to ensure that questions are answered as intended. Similarly, when contrasted with observations, a verbal protocol enables the researcher to pose specific questions about the participant's thought process rather than relying solely on what the participant communicates as part of the exercise. A verbal protocol also requires less work from the learner or participant than do written responses. For these reasons we advocate verbal protocol data as the basis for scoring performance. However, this approach is admittedly more time consuming and expensive than others. We therefore provide recommendations for collecting and scoring data from each of the three sources.

Verbal Protocol Data

Examples of Settings

Verbal protocol data may be captured as part of a training exercise or as a stand-alone session. In any case, it is necessary to base the session around a scenario or tactical situation to which the participant must respond. The scenario might be a TLAC vignette, a tactical decision game, or even a simulation of a tactical incident.

Data Collection Recommendations

The goal should be to capture the participant's decisions, judgments, and the thought process and rationale behind them. To do so, ask the following types of questions:

- What are the critical issues or facts to consider?
- What is your assessment of the situation?
- How could the situation unfold with what you know now?
- What would be your biggest concern at this point? What would be your top priority?
- How would you approach this situation? What would you do?
- Have you seen any situation like this before? Briefly describe.
- What other information do you want about this situation, if any? How would you get [element of information mentioned]?
- How would that information affect your understanding of the situation?

You will need to customize your protocol to the vignette you are conducting. For example, when new information becomes available in the scenario or when the situation has changed, you might ask a question about how the change impacts the participant's situation assessment. Or, if a subordinate in the exercise provides a situation report or asks for direction, you might ask a question about how the participant will respond to the subordinate. In Appendix A, we provide an example of a vignette script and the verbal protocol questions posed to the participant during the vignette session.

Additional tips for conducting the verbal protocol include:

- Conduct the session one-on-one. You should be eliciting responses from one individual at a time.
- Take time-outs during the session. By pausing the exercise or tactical problem at points where new information has been provided to the participant, you can capture his/her thought process as he/she works through the implications of the additional information.
- Preface the verbal protocol session by informing the participant that you would like to hear everything that he or she is thinking about. Encourage the participant to tell you as much as possible as he or she answers the protocol questions, even if he or she believes the thought to be obvious or a "no-brainer."
- Follow up on answers by asking "Why?"
- Follow up on answers by asking "Is there anything else you're thinking about?" to ensure that you are getting as much information about the participant's thoughts and considerations as possible.

Written Response Data

Examples of Settings

As with the verbal protocol approach, written responses must be captured in the context of a tactical scenario or simulation. For example, you may present participants with a paper-based tactical decision making exercise or a computer-based tactical situation that evolves over time.

Data Collection Recommendations

The goal should be to capture the participant's decisions, judgments, assessments, and the thought process and rationale behind them. To do so, develop questionnaires with the following types of questions:

- What is your assessment of the situation?
- What is your plan?
- What orders will you give your subordinates?
- Describe the rationale behind your plan.
- What is your greatest concern?
- What do you believe will happen as the situation evolves, and why?

Additional tips for eliciting good written response data include:

- Provide a great deal of white space in which participants can respond to each question. Extensive space to write conveys the expectation that the answers should be in the form of paragraphs rather than one or two sentences.
- Give participants plenty of time to write their responses. Encourage them to write as much as possible.
- To ensure thorough responses, keep the participant's mental and work load reasonably low. Responses written at the end of a four-hour training session will not be as complete as those written after only one or two hours of training. We also recommend eliciting responses for no more than two tactical situations in a single session. When participants have to answer the same questions again and again, their responses gradually lose their thoroughness.
- If the simulation enables the participant to act on the tactical situation and change it (e.g., a game-based trainer), consider taking time-outs in the simulation during which the participant can write responses to the questions. This ensures that he or she is reporting judgments and assessments in the moment rather than attempting to remember at the end of the session what he or she was considering earlier in the simulation.
- If the session takes place with multiple participants (e.g., a decision making exercise in a classroom setting), have participants complete their response forms prior to engaging in discussion or after-action review with other participants or an instructor.

Observational Data

Examples of Settings

Observations may be conducted during group training exercises to assess the cognitive performance of individuals. Typically, a group leader will be the target for the assessment. One example of a suitable setting is a planning exercise for a commander and his staff. As with the other two data types, observational data must also be collected in the context of a tactical scenario or problem.

Data Collection Recommendations

Observations will be more difficult to code using T-BARS than the other two data types due to the cognitive demand placed on the rater. He or she will have to listen and watch performance and quickly choose a behavioral descriptor to account for the performance. To do this, the researcher must be very familiar with the content of the T-BARS in advance. He or she must have a solid understanding of the cognitive profiles for each level within each theme as well as a recollection of the main (or most often used) bulleted behavioral descriptors within each scale.

The following recommendations apply to coding observational data:

- When possible, use at least two researchers to rate each participant being observed.

- Develop an observation guide that enables you to briefly document the behavior or utterance in one column, and the two T-BARS ratings (theme and level) in two other columns.
- To minimize the amount of page turning while observing, we recommend that you use large (e.g., 11 x 17) paper and print each of the four T-BARS on a single sheet.
- Expect that you will not be able to rate as many behaviors while observing them as you would be able to rate using verbal protocol or written response data over the same period of participant performance. Due to the increased workload in this setting, the segments of data you will code will be larger (and thus fewer) than if you were working with a session transcript.

Preparing Data for Coding

Verbal Protocol Data

To code verbal protocol data, you will need to break the data record (i.e., transcript) into several data segments. Each segment should represent a single, distinctive behavior or thought. The segments will be short. They may be a sentence or two. They may be a portion of a sentence. It is not likely that a single behavior/thought will span more than three sentences.

The following is an excerpt from a transcript where the data has been segmented ("///" represents a new segment). The bold type denotes researcher questions and comments.

> My mission has not changed. I still have to get going forward. That's not a problem. /// I'm now starting to get a little concerned about my communications capability. Platoon Leader of my supported host nation feels the same way – we need to keep moving. /// And getting them the best help right now is not going to be...I can't help them at this point in time. /// I don't have the assets to do that. And I'm not going to cut my strength and detach anybody. Everything has to get through. /// The only thing I can send through the translator to the village elder is "we will be back." Not we will be back, we're going to have to send back we will notify people ahead of time. /// I'll also be interested in finding out who he talked to. He's got (inaudible) how to get it done. /// **Is there any other information you'd like to have at this point?** From the elders or from...? /// **Just about the situation. If you had an information wand, what three wishes would you make?** I know he has people he's concerned about as an elder, getting his people out of there. That may die as a result of me not digging them out. /// I'd love to have commo back to the rear. I'd love to be able to call them right now. /// Everything has to get through, so I can't leave anything, and I can't leave anybody. So right now, I've got to keep pushing on.

After you have segmented the data, enter it into a coding table. We suggest the following format shown in Table 6.

Table 6

Sample Coding Table Including Data Segments

#	Data Segment	Theme	Level	Notes
1	Things I need to know. I'm thinking about, I've got to know the condition of the route between A and T and T to Q and L.			
2	I've got some minimal information regarding obstacles within the city.			
3	I've got no information regarding where sniper fire is coming from, where it seems to be focused and so forth. I'd want to get more information on that if I could.			
4	In terms of the critical tasks, as I see this in sequence, is I've got to do a route reconnaissance. I'm not gonna proceed down that route until reconnaissance is complete.			
5	And I've got to think about how to task organize that route reconnaissance. I'm thinking about how I'm going to organize my road marks to provide the best security that I can. I've got to consider possibility of ambush, possibility of mines, having to do mine clearing operations, and be structured to do that.			
6	I've got to organize for movement to contact so I can develop the situation without having my whole force committed along a route.			
7	I've got to have more information, I need more structure, more detailed information about the town of Agdam, the high speed mounted approaches, how movement occurs in that city, where the key intersections are that facilitate the movement of forces in and around that city. That will of course then lead me to determine how I'm going to array and deploy my forces in order to secure that site, which is also my task.			
8	There's also a requirement, for example, to secure a helicopter landing area. That task in itself, there's specific terrain that's suitable for helicopter operations. I don't have expertise in that in my organization, but personally I know generally what those requirements would be.			

In the Theme column you will enter one of the four themes or mental models—Assets, Mission, Enemy, or Terrain—addressed by the data segment. In the Level column you will enter a number 1-5 to reflect which level of performance corresponds to the behavior/thought from the

data segment. The Notes column can be used to insert comments about the code to yourself or to the other rater(s). For example, you may lack confidence in your rating due to ambiguity or vagueness in the data segment. In this case you may wish to come back to that segment once you have read more of the transcript and better understand the participant's meaning. You may also wish to confer with the other rater(s) on his or her interpretation of the segment.

During the coding process you may find that some segments encapsulate more than one theme or level. In these cases, you may wish to further break down the data into additional segments.

Written Response Data

Written response data should be handled in much the same way as verbal protocol data. Refer to the previous section for guidance on preparing written response data for coding.

Observational Data

Observation-based coding is unique in that you will be generating the data record while you are assigning ratings. You also will typically lack a thorough record of performance, as you will not be able to capture everything that is said and done by the participant. We recommend the following format in Table 7 to support observational data coding:

Table 7

Sample Format for Coding Observational Data

Utterance or Behavior	Theme	Level

While coding, use the first column—Utterance or Behavior—to summarize the behavior you are observing and coding. For example, "Describes route selection" or "Identifies need to communicate with local leader." It is likely that you will not be able to document the full content of the utterance or behavior (e.g., "chooses Route Green because there have been no improvised explosive devises (IEDs) on that road and because it traverses fewer urban areas than Routes Blue or Yellow") due to the need for quick documentation. Rather, summarize the behavior and let the code you assign to it characterize the content.

Sample Ratings

Table 8 below provides an example of verbal protocol data from three separate interviews that has been coded. It links data segments to the Themes, Levels, and specific Behavioral Descriptors that describe the cognitive performance of the participant. Note that it is not necessary to document specific behavioral descriptors when implementing the T-BARS tool. We provide the descriptors here to indicate examples of how they are operationalized within a data record.

Table 8

Example of Coded Verbal Protocol Data

#	Data Segment	Theme	Level	Behavioral Descriptor
1	Look at my road. I have no…I'm heading further up into the valley, so I'm not going to be able to make (inaudible) and I have no commo back to my rear. Which is not good.	Assets	2	(C) IDescribes general posture for organic assets to take rather than specific tasks.
2	My mission has not changed. I still have to get going forward. That's not a problem.	Mission	2	(C) States what needs to be accomplished (mission task) but not how to do it.
3	I'm now starting to get a little concerned about my communications capability. Platoon leader of my supported host nation feels the same way – we need to keep moving.	Assets	2	(C) Articulates a consideration of the safety and security of assets (including Soldiers).
4	And getting them the best help right now is not going to be…I can't help them at this point in time.	Mission	2	(C) Makes a statement about the situation (planning and execution) in terms of mission analysis without intent as a "lens."
5	I don't have the assets to do that. And I'm not going to cut my strength and detach anybody. Everything has to get through.	Assets	3	(C) Identifies trade-offs, benefits, and risk of splitting or reassigning assets.
6	The only thing I can send through the translator to the village elder is "we will be back." Not we will be back, we're going to have to send back, we will notify people ahead of time.	Mission	2	(C) Makes a statement about the situation (planning and execution) in terms of mission analysis without intent as a "lens."
7	**Is there any other information you'd like to have at this point?** From the elders or from…?	Assets	3	(C) Asks questions about availability of non-organic assets. [big picture]
8	**Just about the situation. If you had an information wand, what**	Assets	4	(C) States consequences or effects of asset usage beyond specific primary effect.

(Table Continues)

#	Data Segment	Theme	Level	Behavioral Descriptor
	I know he has people he's concerned about as an elder, getting his people out of there. That may die as a result of me not digging them out.			
1	Also we need to know what groups or tribes, political groups are along that route, what areas, territories we may be moving through to address any kind of political issues that might exist there	Terrain	4	(H) Describes process by which judgment should be made about terrain.
2	and also gather further intelligence on the potential opposing forces that might be there.	Enemy	2	(H) Asks questions/seeks information about what enemy is doing in own sector.
3	I think I mentioned intelligence but the key thing is gathering more information on, get a quick route recon, I would want a plan in more detail about reconnaissance with detailed information about the chokepoints, the aspects of, what we call local control on that route, I mentioned the tribes, the local groups or factions, I'm trying to define very specifically with great details about at what road intersections or buildings or whatever that could cause a change or a group change to occur.	Terrain	4	(J) Identifies information needed on terrain, for example, features or conditions that must be identified during planning due to implications for mission (e.g., mosques, nature of a road).
1	I'd want as much intelligence as I can possibly get on the enemy/potential enemy within that whole map of the city.	Enemy	2	(H) Asks questions/seeks information about what enemy is doing in own sector.
2	**How would you expect that the situation might unfold from here?** I would expect light resistance maybe; I would expect light resistance/wouldn't expect NO resistance, but I would expect light resistance.	Enemy	5	I Makes a projection about how enemy or populace will react to own actions.

Frequently Asked Questions for Data Coding

Question: Should I take into account the context around the data segment – for example, the preceding segments and the segments that follow it – when I code it?

If the meaning of the data segment being rated is clear without using the surrounding context, then do not use the context around it to make a judgment. In cases where the participant's utterance or behavior is unclear due to an ambiguous reference (e.g., to an unnamed person, location, route, etc.), or an unfinished sentence, for example, you may wish to use the context around it to make a judgment.

Question: What do I do if I don't understand the meaning of the participant's utterance?

If even after using the surrounding context you cannot understand what the participant has stated, do not code that item.

Question: What if more than one behavioral descriptor seems to account for the data segment?

Select the one behavioral descriptor that BEST describes the data segment. If more than one descriptor from the same level seems to account for the data segment, there is not an issue; simply assign that level to the segment. If descriptors from separate levels seem to account for the data segment, re-read the descriptors for subtle differences in their meaning and select the best description for the data segment. If this fails, consider the cognitive profiles for each level in question and assign the level that best describes the individual's proficiency as indicated by the data segment.

Question: How do I deal with a participant who changes his mind from one segment to the next?

An individual who flip-flops back and forth as to how to handle a situation is experiencing uncertainty as to how to interpret the situation, or as to how to act on his/her interpretation of the situation. Code each segment independently. When you score the data after all the coding is complete, any variability in level ratings will be averaged out.

Question: What do I do if I can't find a behavioral descriptor from the T-BARS that accounts for the data segment?

In this case, consider the data segment uncodeable and move to the next segment.

Scoring T-BARS Ratings

Generating Scores

Once you have coded all the data segments for an individual, the next step is to generate a score for him/her on each of the four mental model scales – Assets, Mission, Enemy, and Terrain.

An individual's score is simply the average of the level ratings for each of the four mental models. Thus, you will produce four numerical scores ranging from 1.0 to 5.0.

First, group the coded data segments according to theme/mental model. All the Assets-related segments go together, all the Mission-related segments go together, and so forth. Then calculate the average for each theme by adding all the level ratings and dividing by the number of segments within that theme. Round the resulting number to the nearest tenth. Put the four scores together to generate an individual profile like that shown in Table 9.

Table 9

Example Score Profile

Participant: CPT Jones	
Theme	**Score**
Assets	3.7
Mission	3.5
Enemy	3.2
Terrain	2.9

In situations where more than one rater has coded data for an individual, we recommend reconciling any discrepancies in coding prior to calculating the score profile. See Section IV on Interrater Reliability for tips on improving consensus across raters.

When raters disagree on theme, you may either 1) discuss the item and determine that one rater will change his/her theme rating to match the other rater's code, or 2) count the data segment twice in the overall score calculation, once for each theme to which it has been attributed.

For data segments on which raters agree on theme but do not agree on level, you may 1) discuss the item and determine that one rater wishes to change his/her level code to match the other rater's code, or 2) average the two level ratings and calculate these new averaged level ratings into the overall score for the theme.

Making Sense of a Score Profile

The score profile you generate for an individual enables you to 1) make comparisons with other score profiles (e.g., when examining the impact of a training intervention or battle

command support technology on learner/user cognition); or 2) diagnose his or her level of cognitive proficiency and performance as a tactical thinker. When your goal is the former, it is relatively straightforward to make sense of a score profile. You can judge whether one or more of the tactical mental models improve or decline as a result of the training or technology by examining whether the scores increase or decrease.

When the goal of applying T-BARS is to diagnose an individual's cognitive proficiency, the score profile should do two things: First, it should indicate whether a particular mental model (or set of mental models) is underdeveloped relative to the others. For example, if the participant scores a '4' on Terrain but a '2' on Enemy, there is an indication that future training sessions should focus on strengthening models of a thinking adversary. Second, it provides a general indication of the participant's overall stage of cognitive development across the four mental models. For individuals in combat arms domains, we expect mental model development to follow a general sequence illustrated in the Figure 1. The Assets and Mission mental models are hypothesized to begin developing first. The Enemy mental model will begin to form once the individual has a foundation in Assets and Mission. Finally, the Terrain mental model initiates development once the other three have matured to some degree. It is not clear to what extent the early mental models must develop before the later ones can begin to develop. Once individuals reach Level 3 or 4, they begin to manipulate the mental models and gain skills in Seeing the Big Picture, Considering Timing, Considering Contingencies, and Visualizing the Battlefield, typically in that order.

With the hypothesized developmental sequence in mind, you can use the score profile across the four mental models to approximate the learner's overall level of proficiency. For example, a score profile where Assets = 3.6, Mission = 3.8, Enemy = 3.2, and Terrain = 2.7 indicates that the individual is approximately at Stage 3, or Competent, overall. Likewise, an individual who scores mostly in the range from 3.5 – 4.5 would be around Stage 4, Proficient, overall. And a learner who scores in the range from 1.5 – 2.5 is likely to be a Stage 2 Advanced Beginner.

Note that the practice of labeling individuals according to the five stages of cognitive skill acquisition is not an exact science. Dreyfus and Dreyfus (1986) warn that the five stage model enables you to label a particular performance, but not necessarily an individual. It is our contention that T-BARS scores should be used as general indicators of an individual's proficiency on the specific task or exercise that produced the score. Repeated application of T-BARS to examine the same learner's performance across a range of tactical problems provides an increasingly accurate measure of the individual's overall proficiency. When the goal is to diagnose an individual's cognitive development, the real value of T-BARS and the five-stage model is to suggest next steps for training. The score profile is not intended for personnel selection or to diagnose an individual's potential in any way.

Implications of a Score Profile

The paragraphs below offer suggestions for training individuals according to their current approximate stage of cognitive development. For each stage, there are recommendations for the content of training scenarios as well as instructional strategies that are thought to be best suited

for facilitating the individual's movement toward the next stage. These recommendations are taken from Ross, Phillips, Klein, and Cohn (2005). Ross and her colleagues present these guidelines as educated extrapolations from the research literature on cognitive skill acquisition, but they have not undergone formal validation.

Novices

Key Components of Scenario Design. Existing military training is very strong for individuals at the novice level. They require standard rules to anchor their thinking and knowledge about how to execute procedures. However, introduction of scenarios into the novice's training program can assist them in developing an understanding of when and how the rules and procedures apply operationally. Tactical decision making exercises for novices should utilize a ground-based (rather than bird's eye) perspective and:

- Focus on utilization of assets and requirements for mission accomplishment. Most of the content of the scenarios should enable novices to practice executing procedures and tactics (e.g., movement to contact, establishing a blocking position) *in context.* Learners should practice on a range of scenarios that illustrate how tactics must be implemented somewhat differently depending on the particulars of the situation. Exercises should also require learners to allocate assets to various mission tasks and receive embedded feedback about the effective range of weapons in context and in the time it takes to traverse between points given situational factors such as road conditions and weather. They should illustrate for the learner that a unit is not a single fused entity as it appears on a tactical map, but rather consists of moving pieces and parts (like people and vehicles). This enables learners to begin forming mental models of assets that can be split up or attached to other units, and conceptualizing groupings that occupy more than a static grid coordinate on a map.
- Incorporate simple aspects of a dynamic enemy. At this level it is useful for scenarios to exhibit to the learner that the enemy is not static. He moves around the battlefield and splits up his forces (e.g., puts snipers alone in towers) just like friendlies can do. At the novice level, this is sufficient introduction of the enemy.
- Incorporate simple but meaningful terrain features. Scenarios can include hills or other elevated areas that impact line of sight. They can introduce features that will exhibit the difference between cover and concealment like buildings (cover and concealment, depending on the construction) or automobiles (concealment but not cover). And they can present dirt versus paved roads that differentially affect rates of movement.

Instructional Strategies. Novices will be best served by practicing on a range of scenarios with different assets available and different mission requirements. The goal is to help them begin to develop their mental models across a wide range of asset and mission types in order to better understand asset capabilities and mission tasks in context.

At the novice level, instructors, or coaches, or mentors are necessary to guide and direct the learning process more so than at the later stages. Following tactical exercises, an instructor-

led after-action review should focus on the following lines of questioning and probing regarding the learners' experiences:

- Asset capabilities. What was learned about how to use the assets' capabilities in the context of the situation?
- Mission. What actions were taken and why? Was the mission accomplished? Why or why not?
- Enemy. What was learned about the enemy? What was surprising about the enemy? How might learners think about him differently next time?
- Terrain. How did terrain features impact the mission?

Advanced Beginners

Key Components of Scenario Design. Advanced beginners are ready to make meaning out of the experiences they glean from scenario-based training. At this level, scenarios can supplement existing training by enabling learners to practice implementing tactics that have been newly introduced and employing assets whose capabilities they are learning. In addition, scenarios for advanced beginners should incorporate enemy and terrain models that are more complex than those in the novice scenarios. Specifically:

- Scenarios should reflect an intelligent, dynamic adversary. The enemy should *not* follow the templates that have been taught in classroom instruction or case study analysis. Enemy forces should move and take action while the learner deliberates about his own actions. The goal is to break the learner out of the mindset that the enemy will be predictable and static.
- Scenarios should incorporate terrain that has significant impact on the workability of potential courses of action. For example, movement along a straight, flat road should result in being spotted and engaged by the enemy. Furthermore, enemy courses of action should leverage terrain features (e.g., pin friendly forces in a choke point or against an unfordable river) to illustrate the role of terrain on the battlefield.
- Asset capabilities should continue to be exercised, just as at the novice level. Scenarios should incorporate units that are not full strength or units that have had assets attached or detached (or lost in previous battles). At platoon level and lower, friendly assets must be depicted as individual moving pieces (Soldiers, vehicles, and so forth) rather than as unit icons that move as a whole. Further, some scenarios should reward learners for thinking ahead about what other assets might be needed and keeping a reserve to deal with future events. Other scenarios should reward the decisive employment of the learner's full force. Learners need to develop an understanding of the trade-offs of keeping a reserve element or not, and begin to project ahead to assess what might happen in the future that will require preparation and readiness. Finally, scenarios can illustrate how assets can be used to acquire information to reduce levels of uncertainty. Learners should receive useful information (e.g., about the enemy's activities or other important battlefield features) from assets that are positioned to see a wider view than the learner himself; in this way, advanced beginners can develop mental models about how to proactively acquire information.

- The mission required by the scenario should be relatively simple and straightforward, and should correspond to tactics and missions that have been taught in classroom or analogous instructional settings. However, some advanced beginner scenarios should incorporate mission tasks that must be prioritized, such that learners fail if they do not address the higher-priority task first.

Instructional Strategies. Advanced beginners would benefit from practicing with the same scenario several times. Multiple iterations allow learners at this level to understand how different uses of assets and various courses of action impact the outcome. Instructors should encourage experimentation at this stage, even with courses of action that are judged to be non-optimal. It is important for learners to internalize the specific reasons that some courses of action produce better results than others. And, learners may find unexpected positive outcomes from a particular course of action. If possible, instructors should be able to introduce small alterations in the environmental conditions to illustrate how variations in situational factors influence the workability and "goodness" of available courses of action.

Like novices, advanced beginners still require an instructor to guide and direct their learning process. After-action reviews should be instructor-led, and can address the following lines of questioning:

- Utilization of assets. What worked, what did not work, and what factors need to be considered when deciding how to employ assets (e.g., morale, readiness)?
- Mission tasks. How were the tasks approached, and why? Which approaches were beneficial and which were not? Why and why not?
- Enemy. What did the enemy do, and why? How did learners know what he was doing? What information led to their assessments? Were their assessments accurate, and why or why not?
- Terrain. What features were noticed during planning? How did terrain impact the mission during execution, and why? How would the learners approach the terrain layout differently next time?

Competent Individuals

Key Components of Scenario Design. Tactical exercises for competent performers should enable continued development of *Asset*, *Mission*, *Enemy,* and *Terrain* mental models, but in the context of the *Consider Timing* and *Consider Contingencies* cognitive processes. In other words, scenarios should present situations where success relies on the timing and sequencing of the operation, planning for contingencies, and adapting contingency plans as the mission progresses. Specifically:

- Scenarios should introduce surprises during the execution of missions to provide practice in rapidly responding to the changed situation. For example, friendly units could become unable to perform (e.g., because they cannot reach their intended position, or because a weapon system breaks down); the enemy could move in a non-traditional way or bring a larger force than was reported by intelligence or reconnaissance; key roads could be too muddy to traverse or blocked by refugees

demanding assistance; or, higher headquarters could deliver a new frag order based on an opportunistic target or other change in the situation.

- Scenarios should present conflicts that require prioritization of mission tasks. Learners need to be forced to determine which part of the mission order is most important to higher headquarters based on the commander's intent statement. Success should be contingent on taking actions that support intent.
- Mission orders should incorporate strict time requirements, and the scenarios should build in realistic timing of force movement, engagement with the enemy, and so forth. If success relies on accomplishing an objective by a particular time, and learners are forced to make judgments about how long the prerequisite tasks will take, then good feedback about those timing judgments will be available.
- Scenarios should require proper sequencing of tasks in order for the learner to accomplish the mission. That is, learners should be able to see how the mission breaks down when certain tasks, like thorough route reconnaissance, are not accomplished prior to other tasks, like moving forces along a route.
- Scenarios should introduce the utility of non-organic and non-military assets. For example, learners can be encouraged to request assets from higher headquarters or another by realizing that the mission can only be accomplished by accessing those assets. Also, scenarios can present civilian resources such as host nation officials, village elders, relief workers, or U.S. ambassadorial staff members who can provide valuable information or serve important roles (like communicating with the local populace).

Instructional Strategies. At the competent level, instructors play a key role in mental model development, but their participation at the competent, proficient, and expert levels is not required as persistently as it is for novices and advanced beginners. In lieu of an instructor, feedback can be delivered by developing expert responses against which learners can compare their own performance. Also, feedback should illuminate situational cues, factors, or demands that should have prompted learners to change their approach or move to a contingency plan. The following issues should be addressed with individuals at the competent level:

- Prior to execution, contingencies. What are the different ways the plan could play out, and how would the learner know if that were happening?
- Prior to execution, the enemy. What might he be attempting to do, and why? How might the learner assess the enemy's objectives as the situation plays out? What information should the learner be seeking?
- Prior to execution, terrain. What are the critical terrain features on the battlefield? How might they impact both friendly and enemy courses of action? How might terrain be leveraged and used against the enemy? How might the enemy leverage terrain features and use them against friendlies?
- Mission plan. Why did the plan break down? What should have been the early indicators that plan wouldn't play out as intended?
- Situation. What were the cues and factors available? How might they have been interpreted?
- Timing and sequencing. What issues regarding timing and sequencing needed to be considered and why?

- The Big Picture. What was higher HQ trying to accomplish? What was the learner's role in accomplishing the larger mission? Did the learner contribute in useful ways to the larger mission?

Proficient Individuals

Key Components of Scenario Design. In general, tactical exercises for proficient individuals should incorporate high levels of complexity, ambiguity and uncertainty, sophisticated coordination requirements, and situations that evolve and change rapidly into tough dilemmas. More specifically:

- Scenarios should present situations where accomplishing commander's intent requires a different approach than accomplishing the explicit mission tasks.
- Scenarios should incorporate an enemy who uses non-conventional forces and techniques. For example, the enemy could use civilian vehicles, dress deceptively, or otherwise mislead the learner.
- Scenarios should incorporate substantial situational changes during execution to force the learner to revise the existing course of action or develop a new one on the fly. Proficient performers should be skilled at recognizing how the situation has changed, but they require multiple repetitions in order to develop and refine the action scripts within their mental models.
- Scenarios should incorporate feedback on secondary and tertiary consequences of action. For example, in a nation building/humanitarian assistance mission, an emotion-driven decision to provide assistance to desperate villagers rather than continuing with the original mission may have consequences for mission accomplishment and domino into a larger impact on the operation. Depending on the particulars of the situation, an action like this could prompt locals to set unwarranted expectations about how relief is provided, or bog down relief efforts to a greater need elsewhere, or have political ramifications for how coalition efforts are portrayed, especially if the assistance provided was insufficient due to its pop-up nature.
- Scenarios should require timing, sequencing, and coordination between and across units rather than only within the learner's own organic assets. This enables learners to form mental models of friendly forces as a larger team effort and to understand the capabilities and limitations of other, dissimilar units (e.g., air or artillery).

Instructional Strategies. The facilitation, in whatever form it takes, should exhaust the learner's way of understanding and approaching the situation. He should be required to cite his own personal experiences and exemplars for perspective on his views of the situation depicted in the scenario (Benner, 2004). Benner recommends that instructors teach inductively, where the learner sees the situation and then supplies his own way of understanding the situation.

When an instructor is available to facilitate the scenario-based training, semi-structured time-outs during execution of the scenarios would be beneficial. These periods of inquiry and reflection could encourage learners to discuss their current interpretation of the situation, their mental simulation of how the situation is likely to play out, and their ideas about what courses of action are most likely to produce the desired results. Discussion amongst the learners would be

nearly as valuable for proficient performers as the probes and dialogue with the instructor. Likewise, after-action reviews following execution of a mission should encourage dialogue and questioning between the instructor and learners about their interpretations of the situation, their mental simulations and visualizations of the battlefield, and especially their consideration of how various courses of action supported or failed to support the mission goals.

When an instructor is unavailable, a couple of different approaches can provide adequate substitutes for proficient learners. First, as noted above, individuals at this stage of development can learn quite a bit from their peers. Semi-structured after-action reviews can be provided to groups of learners to guide their discussion of the exercise. The reviews should focus on the same questions used when an instructor is present—how the situation was assessed, how learners projected into the future, and the rationale for the courses of action employed or adjustments that would be made to actions based on the outcomes of the scenarios. In addition, learners should be encouraged to share past experiences that have influenced their thinking about the scenario.

Just as competent learners are likely to benefit from expert responses, proficient learners can also use information generated from the experts as another instructor-free approach. At the proficient level, expert responses should include very detailed information about how experts thought about the scenario at multiple intervals within the scenario, if possible. This information can be generated by conducting in-depth, cognitive task analysis (CTA)-like interviews with a group of two to four expert tacticians. In particular, learners should be provided with experts' interpretations of the situation, including the cues and factors they recognized pertaining to the enemy objective, the friendly status, and other aspects of the battlefield (e.g., terrain or non-combatants). They should also be shown the experts' projections (i.e., mental simulations) about how the situation would play out and the rationale for those projections as well as visualizations of first, second, and third order consequences. There should also be a discussion about the courses of action taken by the experts along with a detailed rationale regarding asset allocation, prioritization and primary goal(s), and aspects of timing and/or sequencing.

Other topics to review following scenario-based training sessions, with or without instructor leadership, include the following:

- The larger picture. What is the larger organization trying to accomplish? How can the learner develop opportunities for the larger organization, or otherwise feed the overall objective over and above own mission tasks?
- Enemy intent. What is his likely intent? What aspects of the situation could have revealed clues about his intent? How can it (or was it) denied by friendly forces?
- Contingencies. What are some alternative ways the situation could have played out? What situational cues would suggest those particular outcomes? What responses (i.e., courses of action) would be appropriate for the alternative contingencies?
- Actions. What courses of action could be taken in response to changes in the dynamics of the situation? What are the relative advantages and disadvantages of each?

Experts

Key Components of Scenario Design. If experts are involved in scenario-based training sessions, they may reap the greatest benefit as a mentor to less experienced tacticians. By coaching and being forced to communicate what they know to others, they reflect on and thus strengthen their existing mental models. It may also be possible to develop Garden Path scenarios (Feltovich et al., 1984) in training to challenge the fine discriminations within experts' mental models.

Instructional Strategies. Experts are likely to benefit from peer discussion groups that reflect on a shared real-world experience, full-scale exercise or simulation, or operational planning session (e.g., plan development to address a potential crisis situation in a real-world "hot spot;" experts are generally the ones called in to develop plans and contingencies, and this setting can provide a learning opportunity for highly-skilled tacticians). Discussions could be structured to address:

- Enemy intent. What was (is) the enemy's objective and why? What situational cues and factors led to that assessment? At what point in the mission did the enemy's intent and his course of action become clear? What were the key indicators?
- Big picture. How did (could) individual units, or joint/coalition forces, work together to meet the overarching mission? Were assets shared in ways that supported mission accomplishment? What other configurations of assets could have addressed the larger mission intent, rather than unit-specific orders?
- Contingencies. Did the mission play out in unexpected ways that were not imagined in contingency planning sessions? When was the change noticed? Were there early indicators that could have revealed the new direction to commanders sooner?
- Visualization. What were (are) the friendly and enemy leverage points on the battlefield? How did (could) friendly forces deny enemy intent by using the terrain, non-conventional assets (e.g., civilians), and other resources or strategies?

IV. Establishing Interrater Consensus

If you plan to use T-BARS within your organization as a way to assess tactical thinking proficiency, you may desire to use multiple raters to assess performance. In this case you will need to establish interrater reliability to ensure that all raters are using the scales in a consistent manner.[2] To establish consensus, we recommend the following process to be performed prior to implementation of the T-BARS to produce an assessment:

Instructions for Establishing Interrater Consensus

1. Generate a data set and break it down into data segments as described in Section III. We recommend 25-35 data segments to rate during this process. Attempt to include data from participants from a range of performance levels so that you can practice using all five levels of the T-BARS. Also attempt to include data that will reflect all four themes. For example, some tactical exercises do not place much emphasis on terrain-related judgments. Ensure that the tactical exercise(s) from which you pull data require the participant to consider all four themes.

2. Generate a coding table like the one on page 21 to be filled out by the raters. Include the following four columns: Data Segment; Theme; Level; Behavioral Descriptor. Add a fifth column for "Notes or Comments."

3. Print out the four T-BARS:

   Theme 1: Know and Use All Assets Available
   Theme 2: Focus on Mission and Higher's Intent
   Theme 3: Model a Thinking Enemy/Populace
   Theme 4: Consider Effects of Terrain

4. Read the first page of each of the four T-BARS in order to get a sense of what the theme is about and what each of the five levels within the theme is intended to represent with regard to performance and cognition. Each of the bullets (marked by a letter from 'A' to 'M') within a column describes a behavioral indicator that represents cognitive functioning and domain mental models at that level (1-5) of performance.

5. Read each data segment. Select the theme to which it corresponds. Then within the theme, select the behavioral descriptor that best describes the data. If you are unable to find a behavioral descriptor that explicitly describes the data, then consider a) looking at another theme, or b) using the general descriptors of each level within the originally selected theme to rate the data. Then record the theme, level, and behavioral descriptor (bullet) you've selected on the coding sheet. You may use the context provided by surrounding data to code a particular chunk if it adds clarity to the participant's response.

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[2] For information on the interrater reliability testing performed by the T-BARS developers, see Phillips, Shafer, Ross, Cox, & Shadrick (2005).

6. If a segment seems unrateable because it lacks the content required to make sense, or if seems to be an aside or otherwise unrelated to the vignette or exercise, then do not rate it. Simply record a dash in that cell on the coding sheet.

7. If a segment seems to contain elements of multiple themes or multiple levels, then break the segment apart and code each sub-segment. Inform the other rater(s) of the new segment(s) so that all raters code identical segments.

8. As you go through the data, record any issues in the "Notes or Comments" column of the coding sheet. For example, if you have difficulty discriminating which of two or three behavioral descriptors best fits a particular data segment, record the options you are having trouble choosing between. If you find any of the behavioral descriptors from the T-BARS to be confusing, record those issues on a separate sheet of paper.

9. Once all raters have completed their ratings, compare across the raters. First calculate percentage agreement across the Theme ratings. Then calculate percentage agreement across the Level ratings *ONLY FOR THE SEGMENTS ON WHICH RATERS AGREED ON THEME*. You should also wish to calculate the number of cases in which raters' agreement on Level was within one point (e.g., one rater coded a '2' and another coded a '1' or '3').

10. Agreement on both Themes and Levels should be between 70% and 90% to establish interrater reliability. If your agreement is less than 70%, look at the cases on which the raters disagreed and discuss each rater's rationale. You will need to decide on your own rules for interpreting the behavioral descriptors when there is not immediate consensus. We recommend documenting these rules and possibly even adding them to the electronic version of the T-BARS.

11. Once you have discussed the items on which you disagreed and calibrated your interpretations of the problematic behavioral descriptors, repeat the process for establishing consensus until you reach at least 70% agreement.

The following section proved the actual T-BARS for each of the four tactical thinking themes.

Table 10

Theme 1: Know and Use All Assets Available

Combat leaders must not lose sight of the synergistic effects of fighting their command as a combined arms team – this includes not only all assets under their command, but also those which higher headquarters might bring to bear to assist them.

Knows Textbook Capabilities	**Matches Assets to Mission Requirements**	**Utilizes Organic Assets to Accomplish Mission Objectives**	**Recognizes Full Range of Assets Required based on Situational Demands**	**Applies Full Range of Assets to Direct the Outcome of the Battle**
1	**2**	**3**	**4**	**5**
Performance is abstract and rule-based, and focuses on variables in isolation. Individual knows facts about standard capabilities of organic assets such as ranges of weapons, number of vehicles per unit, and so forth. The foundational knowledge required to analyze how assets can be applied to the situation has not yet developed.	*Performance reflects simple analytical processing using a limited experience base. Organic assets are matched to mission requirements. For example, a tank formation would be allocated to the area where heavy armor is needed for protection. Individual has difficulty prioritizing tasks, so asset utilization is driven by capabilities (what the asset can do) over situational demand (what is the most pressing mission task).*	*Performance reflects a mental model of asset utilization, but remains dependent on analysis and planning rather than recognition and intuition. Individual can prioritize mission tasks and predict how the situation could unfold, and an asset utilization plan is generated against that analysis. However, execution is driven by the plan over the situation, so individual has difficulty adjusting asset utilization to meet changing situational demands.*	*Performance reflects a recognitional or intuitive assessment of the situation, but analytical decision making where the individual deliberates about a course of action. Individual recognizes the availability of non-organic and non-military assets in addition to his own organic assets. For example, civilians are recognized to be valuable sources of HUMINT. Situational demands drive asset utilization, rather than the plan or the organic assets at the individual's disposal.*	*Performance reflects a recognitional ability to assess and decide. Individual can visualize specific outcomes of asset utilization and has the ability to avoid unwanted consequences. For example, he knows how to command and maneuver his forces to avoid an uprising by the locals. Individual leverages and coordinates organic, non-organic, and non-military assets to achieve mission objectives.*

Know and Use All Assets Available

1	2	3	4	5
(A) Asks questions about facts of own organic assets.	(A) Identifies how assets can be used in a general sense (e.g., unmanned aerial vehicles [UAVs] can be used for recon), but not how to maximize for current mission.	(A) Articulates how specific organic assets can be used to overcome enemy capabilities and accomplish the mission.	(A) Articulates rationale for employing a particular organic asset based on situational factors.	(A) Leverages non-organic assets from larger organization.
(B) States facts about what assets are organic to own unit.	(B) Makes a straight match of organic asset(s) to portion(s) of the mission without regard to prioritization of effort.	(B) Identifies trade-offs, benefits, and risk of splitting or reassigning assets.	(B) Makes a statement about the availability and/or value of non-organic assets.	(B) Articulates how non-organic assets can be accessed.
(C) States facts about capabilities of organic assets.	(C) Describes general posture for organic assets to take rather than specific tasks.	(C) Articulates rationale for use of specific assets for particular task or mission (e.g., armored vehicles needed for safety).	(C) Makes statements about own and other units as a team rather than isolated entities.	(C) Assembles assets in an integrated fashion based on rapid assessment of situation.
(D) Gives "templated" answers about how assets will be used/restates mission information.	(D) Questions whether assets (e.g., size of force) are adequate for mission or contingencies.	(D) Describes or makes reference to trade-offs of employing assets or keeping them in reserve.	(D) Makes a statement about the availability and/or importance of non-military assets such as civilians.	(D) Makes a statement about assets in terms of what other units need. [Big Picture]

Know and Use All Assets Available

1	2	3	4	5
(E) States facts about status of own assets during execution.	(E) Makes simple acknowledgement that timing of asset utilization is a consideration. [Timing]	(E) Mixes and matches organic assets/units for a common purpose.	(E) Changes plans for assets/asset usage during execution when initial plan is not working.	(E) Makes reference to time needed for other units to act based on their assets. [Big Picture]
(F) Asks questions about status of own assets during execution.	(F) Articulates a consideration of the safety and security of assets (including Soldiers).	(F) Articulates size of force needed for particular mission or task.	(F) Provides rationale for changing the utilization of assets.	(F) Communicates with other units to coordinate action. [Big Picture]
(G) Provides facts about status of own assets during execution.	(G) Communicates current situation to subordinate units during execution.	(G) Employs organic assets to proactively acquire information.	(G) Mixes and matches organic assets based on situational demands (e.g., combines engineer assets or MPs with infantry unit).	(G) Articulates plan for asset usage based on primary effect as well as second and third order effects and consequences. [Visualization]
(H) Describes use of assets without regard to timing and/or terrain.		(H) Calculates time distance based on knowledge of terrain, obstacles, weather, asset capability, etc. [Timing]	(H) Describes asset utilization in terms of meeting time constraints. [Timing]	(H) Refines plan for asset usage during execution based on primary effect as well as second and third order effects and consequences. [Visualization]

Know and Use All Assets Available

1	2	3	4	5
		(I) Indicates the impact of timing and/or sequencing of asset use (e.g., Armored Vehicle Launched Bridge (AVLB) is a very slow tracked vehicle, so you have to anticipate the time it takes to transport it.) [Timing]	(I) Discriminates relative strengths and weaknesses of assets (organic, non-organic, or non-military] within the context of a mission.	(I) Articulates specific plans for use of non-military assets.
		(J) Describes unfolding of events or sequencing as assets are employed. [Visualization, Timing]	(J) Identifies danger area(s) for asset(s) based on terrain and/or potential enemy location or action. [Terrain, Enemy, Visualization]	(J) Articulates how limited assets will be used to produce large effects.
		(K) Matches specific asset to particular location and time. [Visualization]	(K) Discusses sustainability of organic assets (e.g., with food, water, ammo, etc.) in light of situational demands.	(K) Identifies and uses emergent leverage points during execution to maximize asset effects.
		(L) Articulates first order effects of using specific assets at specific times. [Big Picture]	(L) States needs to conserve resources.	

Know and Use All Assets Available

1	2	3	4	5
		(M) Predicts consequences of using assets or not using assets.	(M) Deploys assets in an integrated fashion (not as isolated systems) to achieve larger tactical purpose.	
		(N) Projects what other assets might be needed or useful. [Visualization]	(N) States rationale for asset usage in terms of retaining flexibility of usage. [Visualization, Contingency Thinking]	
		(O) Discusses what assets might be useful for potential specific contingencies. [Contingency Thinking]	(O) States consequences or effects of asset usage beyond specific primary effect (second and third order effects).	
		(P) Identifies approach for using asset(s) for particular contingency(s). [Contingency Thinking]	(P) Articulates rationale for timing and/or sequencing of asset usage. [Timing]	
		(Q) Asks questions about availability of non-organic assets. [Big Picture Thinking]	(Q) Articulates constraints due to troop availability vis-à-vis mission.	

Table 11

Theme 2: Keep a Focus on the Mission and Higher's Intent

Combat leaders must never lose sight of the purpose and results they are directed to achieve – even when unusual and critical events may draw them in a different direction.

Focus on Own Mission	**Discriminate Intent and Explicit Mission**	**Model Effects of Own Mission and HQ Intent**	**Accurate Predictions**	**Support Intent**
1	**2**	**3**	**4**	**5**
Performance is abstract and rule-based and focuses on variables in isolation. Individual fixates on own mission rather than considering larger organization's mission. He is unable to consider higher intent. The foundational knowledge required to analyze steps required for mission accomplishment has not yet developed.	*Performance reflects simple analytical processing using a limited experience base. Mission tasks are paramount to all else, and intent can be articulated but not operationalized. Individual has difficulty prioritizing tasks for mission accomplishment, and is often uncertain or overwhelmed as situation evolves. There is a tendency to rely on direction from higher HQ rather than making own decisions.*	*Performance reflects a mental model of how intent is achieved through mission tasks, but remains dependent on analysis and planning rather than recognition and intuition. Individual can prioritize mission tasks and predict how the situation could unfold, and a course of action is generated based on that analysis. However, performance in execution is guided by an efficient but rigid plan that is not adapted to account for changes in the situation.*	*Performance reflects a recognitional or intuitive assessment of the situation, but analytical decision making where the individual deliberates about a course of action. Individual recognizes how situational factors impact the mission and the path to achieving intent. For example, he can visualize the enemy's likely objective and use of terrain, and he uses that assessment to deliberate about how to support the intent through his own mission. During execution, changes in the situation are recognized intuitively and mission tasks are adapted or changed to continue to support intent.*	*Performance reflects a recognitional ability to assess and decide. Individual can quickly and accurately assess the situation, visualize contingencies, and devise an action plan that accomplishes the intent while avoiding unwanted 2nd and 3rd order consequences. Individual operates from a big picture perspective in which he takes actions that support the short- and long-term objectives of the coalition force.*

Keep a Focus on the Mission and Higher's Intent

1	2	3	4	5
(A) Asks questions about facts of scenario description.	(A) Makes a statement about the situation (planning and execution) in terms of mission analysis without intent as a "lens."	(A) Analyzes intent statement in order to determine what has to be accomplished.	(A) Articulates rationale for sequencing tasks based on situational factors.	(A) States concept of operations rapidly after receipt of mission, citing variable of situation and/or intent.
(B) Asks questions about facts of stated mission tasks.	(B) Exhibits uncertainty about priorities in the mission or does not prioritize.	(B) Debates whether mission will support intent.	(B) Describes how own mission will contribute to larger operation/mission.	(B) Articulates how and/or why course of action or concept of operations supports higher intent.
(C) Articulates understanding of mission without regard to intent.	(C) Expresses uncertainty about what constitutes mission success.	(C) Identifies consequences of failing to complete mission in terms of effect on intent/higher operations. [Big Picture]	(C) Discusses during execution whether actions are supporting intent.	(C) Identifies changes or relevant new information in situation and articulates adjustments to course of action during execution.
(D) Asks for clarification of rules of engagement (ROE).	(D) States what needs to be accomplished (mission task) but not how to do it.	(D) Identifies the need to prioritize mission tasks or subtasks.	(D) Prioritizes actions in order to support higher intent or larger operations (e.g., "I need to do 'this' instead of 'that.' ")	(D) Allocates assets during planning or execution based on a prediction about the enemy.

Keep a Focus on the Mission and Higher's Intent

1	2	3	4	5
(E) Uses "templated" methods for analyzing/planning.	(E) Identifies timing as a consideration in mission tasks. [Timing]	(E) Differentiates priorities in mission tasks.	(E) Predicts how future events can impact own mission and generates contingencies to overcome interference.	(E) Proactively places assets to support larger intent. [Contingency Thinking]
(F) Uses only organic assets for mission.	(F) Identifies information requirements that can impact mission (e.g., what are dangers ahead on route).	(F) Articulates what would be a favorable outcome for a particular task.	(F) Articulates during execution changes that will interfere with achieving intent.	(F) Responds to change fluidly by implementing planned contingency or rapidly articulating new contingency. [Contingency Thinking, Visualization]
(G) Adheres rigidly to stated tasks of mission.	(G) Keeps Higher HQ informed about plans and situation during execution.	(G) Describes future events that may impact or interfere with current mission.	(G) Describes potential impact of non-combatant activity on mission during execution.	(G) Eliminates obstacle to higher intent.
(H) Asks about facts of events during execution.	(H) Relies on Higher HQ to make decisions.	(H) Articulates what task will happen next.	(H) Describes how situation could draw unit away from mission accomplishment (i.e., mission creep).	(H) Creates advantage for higher or adjacent unit. [Big Picture]

Keep a Focus on the Mission and Higher's Intent

1	2	3	4	5
(I) Communicates only within unit about plans and situation.		(I) Articulates in a general manner (i.e., without detail) what the effect(s) of task/ mission accomplishment will be beyond intended effect.	(I) Requests additional support from higher when mission accomplishment requires it.	(I) Presents opportunities to higher or adjacent units. [Big Picture]
(J) Asks questions about scenario facts or events during execution.		(J) States a consideration of actions other than stated mission (implied tasks or additional tasks to meet intent).	(J) Articulates consideration of two or more of the following together: mission statement; own tasks; higher intent; desired end state; what success looks like.	(J) Articulates specific second and third order effects of an action during execution.
(K) Questions own decision making authority.		(K) Seeks clarification of implied tasks.	(K) Alters or refines course of action in light of changes in situation.	(K) Articulates actions necessary to ensure mission accomplishment when faced with threat to mission success during execution.

Keep a Focus on the Mission and Higher's Intent

1	2	3	4	5
		(L) Seeks clarification on potential "be prepared" missions.	(L) Infers priorities from intent statement.	(L) Articulates actions necessary to ensure intent when stated mission is superseded by dynamic events, but intent is still achievable.
		(M) Adheres to plan (tasks and manner of accomplishment) in the face of new and changing information.	(M) Alters or refines course of action based on discovery of new leverage points in situation.	
		(N) Forges ahead with course of action when it is no longer relevant.	(N) Articulates how events will be sequenced.	
		(O) Identifies important aspects of mission that require attention for success. [Visualization]	(O) Articulates how timing or sequencing of events needs to allow for replanning or contingencies.	

Keep a Focus on the Mission and Higher's Intent

1	2	3	4	5
		(P) States general sequencing of tasks without articulating how to accomplish each task. (Q) Articulates timing estimates or sequencing as a critical component of the planning process. [Timing] (R) Notes the importance of timing and/or sequencing for the particular mission. [Timing]		

Table 12

Theme 3: Model a Thinking Enemy or Populace

Combat leaders must not forget that the adversary is a reasoning human being intent on defeating them—it's tempting to simplify the battlefield by treating the enemy as static or simply reactive. Likewise, the local populace has its own motivations that drive its actions within the battlespace.

Uses Enemy Templates	**Regards Enemy as Static**	**Regards Enemy as Intelligent and Dynamic**	**Predicts Enemy Action**	**Denies Enemy Intent**
1	**2**	**3**	**4**	**5**
Performance is abstract and rule-based. Individual acknowledges enemy superficially and equates him with theoretical or doctrinal templates learned in schoolhouse – for example, the typical Soviet offensive formation. The foundational knowledge required to analyze probable enemy actions and objectives has not yet developed.	*Performance reflects simple analytical processing using a limited experience base. Enemy is understood to have an impact on the mission, but is regarded as a static, non-thinking adversary. Individual has trouble distinguishing enemy centers of gravity from the rest of the enemy picture. Individual struggles to make sense of or draw hypotheses about the enemy's objectives.*	*Performance reflects a mental model of an intelligent, dynamic enemy. Individual analyzes the enemy situation and predicts enemy actions in order to formulate an efficient and organized COA that defeats the enemy. Ideas about the enemy's objectives and COA are constructed, but they are general and imprecise. Because the individual is guided by the plan rather than situational demands, he struggles to adapt his COA when the enemy situation changes during execution.*	*Performance reflects a recognitional or intuitive assessment of the enemy's objective and intent, but analytical decision making where the individual deliberates about a course of action that defeats the enemy. Individual continually updates his assessment of the enemy situation and his predictions about the enemy's next steps based on situational factors.*	*Performance reflects a recognitional ability to assess and decide. Individual visualizes how enemy will act and react, and takes actions to deny enemy intent. For example, he recognizes enemy leverage points and takes action to neutralize them or make them unavailable.*

Model a Thinking Enemy or Populace

1	2	3	4	5
(A) Ignores enemy during mission analysis/planning/ execution.	(A) Articulates enemy capabilities with limited or no consideration of current situation's context.	(A) Generates ideas about what enemy might be thinking.	(A) Articulates an assessment of enemy objective, approach, or size/strength based on situational factors.	(A) Develops a rationale as the basis to deny the enemy intent.
(B) Ignores typical enemy capabilities and assets or states them incorrectly.	(B) Makes a general statement about the enemy's approach.	(B) Generates ideas about what enemy's objective might be.	(B) Articulates that own course of action should deny enemy intent, but is unsure how to operationalize.	(B) Articulates how course of action will use terrain, assets, or other resources to deny enemy objective.
(C) Ignores typical enemy tactics or states them incorrectly.	(C) Expresses general concern about enemy situation.	(C) Generates hypotheses about how the enemy might carry out a course of action. [Visualization]	(C) Evaluates two or more courses of action to determine which better inhibits enemy.	(C) Makes a projection about how enemy or populace will react to own actions.
(D) Gives "templated" answers about expected enemy actions (e.g., "typical enemy will…")	(D) Identifies enemy capabilities with regard to impact on own mission.	(D) Questions how enemy might respond to own COA.	(D) Articulates an assessment of how enemy will use the terrain, employ their assets, or use avenues of approach.	(D) Articulates action plan during execution to counter suspected enemy intent.

Model a Thinking Enemy or Populace

1	2	3	4	5
(F) Asks for or states facts about enemy actions during execution (no interpretation).	(F) Generates hypotheses about who may be an enemy/threat during execution.	(F) States expectations about enemy activity based on patterns or specific elements in current situation.	(F) Identifies specific piece of desired information about enemy/populace.	(F) Generates hypotheses about who may be an enemy/threat during execution.
(G) Puts a blue unit in a dangerous spot vis-à-vis enemy.	(G) States only what is observed about enemy during execution (what he is doing) without inference.	(G) Generates ideas about how enemy might use terrain, employ assets, or use avenues of approach. [Visualization]	(G) Generates ideas about what enemy might be doing during execution.	
	(H) Asks questions/seeks information about what enemy is doing in own sector.	(H) Asks questions/seeks information about what enemy is doing in another sector.	(H) Generates ideas during execution about what enemy will do next. [Visualization]	
		(I) Articulates a general expectation about enemy activities or responses to friendly actions (e.g., "I expect light resistance.")	(I) Discusses varied responses/actions to take in response to potential enemy actions. [Contingency Thinking]	
		(J) Articulates disadvantages the enemy's action has created. [Big Picture]		

Model a Thinking Enemy or Populace

1	2	3	4	5
		(K) Articulates specific contingencies (while planning) in response to enemy actions that might be taken. [Contingency Thinking, Visualization] (L) Adheres to execution path in the face of new or changing information about enemy.		

Table 13

Theme 4: Consider Effects of Terrain

Combat leaders must not lose sight of the operational effects of the terrain on which they must fight—every combination of terrain and weather has a significant effect on what can and should be done to accomplish the mission.

Uses Terrain Checklists	**Identifies Important Terrain Features**	**Incorporates Terrain into Own Plan**	**Recognizes How the Enemy May Use Terrain**	**Turns Terrain to Own Advantage**
1	**2**	**3**	**4**	**5**
Performance focuses on identifying discrete features of terrain. Individual uses standard checklists to determine relevant terrain features. The foundational knowledge required to analyze the impact of terrain on the mission has not yet developed.	*Performance reflects simple analytical processing using a limited experience base. Important terrain features are identified and prominent problem areas such as chokepoints are avoided. However, individual remains unable to leverage terrain to own advantage.*	*Performance reflects a mental model of the impact of terrain on the mission. Individual performs an analysis of the terrain and incorporates terrain features into the plan. For example, in an urban setting the tallest and sturdiest buildings are perceived as good locations to occupy. However, the individual tends to adhere to the plan even after the situation has evolved and new information about the terrain becomes available.*	*Performance reflects a recognitional or intuitive assessment of the aspects and patterns of terrain that are critical for friendly and enemy forces, but deliberate analysis of how to utilize the terrain to accomplish the mission. Individual continually updates his view of the terrain and its impact on the mission as the situation evolves and new terrain features and patterns are discovered.*	*Performance reflects a recognitional ability to assess and decide. Individual is quickly able to visualize how terrain will impact the friendly mission and predicted enemy actions. He leverages the terrain to his own advantage and denies the enemy's ability to do the same.*

Consider Effects of Terrain

1	2	3	4	5
(A) Uses checklist to assess terrain (e.g., Observation, Cover and Concealment, Obstacles, Key Terrain, Avenues or Approach [OCOKA]).	(A) Asks basic questions about terrain features.	(A) Appraises, during planning, how individual terrain features are likely to impact own mission.	(A) Articulates how multiple terrain features can be used together to serve own mission.	(A) Immediately recognizes and articulates a course of action that will use terrain to own advantage.
(B) Notes terrain features but not significance.	(B) States how individual terrain features could impact own mission (e.g., weather, roads, forests, hills).	(B) Incorporates possible obstacles into plan (e.g., flooding).	(B) Articulates how specific, multiple terrain features will likely be used by enemy and advantages obtained. [Visualization]	(B) States action or takes action that will deny identified enemy terrain advantage. [Visualization]
	(C) Seeks information (reports) from subordinates on nature of terrain.	(C) Incorporates terrain features into plan (e.g., uses chokepoints as kill zones; accounts for terrain impacts on line of sight.)	(C) Describes *key* aspects of terrain for friendly and enemy courses of action.	(C) States plan or rationale (or takes action) to deny enemy objective by integrating own use of terrain with likely enemy use.
	(D) Speculates on how terrain could impact evolving mission in a general manner.	(D) Makes a statement about the effects of terrain on assets employed or needed.	(D) Deliberates about best way to use terrain to accomplish the mission.	

Consider Effects of Terrain

1	2	3	4	5
	(E) Speculates about how terrain could impact mission as the situation evolves.	(E) Rejects a route due to terrain conditions.	(E) Makes specific statements about how enemy may leverage terrain (e.g., "the enemy may use that hill for observation").	
		(F) Identifies advantage or disadvantage of a piece of terrain.	(F) Deliberates about how to counteract the way in which the enemy is likely to use the terrain.	
		(G) Identifies terrain features that could cause a problem for specific asset(s).	(G) Describes process by which a judgment should be made about terrain.	
		(H) Describes effects of terrain on course of action or singular actions.	(H) Generates specific ideas about how to use terrain, assets, or other resources to inhibit enemy accomplishing objective.	
		(I) Asks questions or identifies information needed about enemy activity along key terrain.	(I) Describes integrated picture of how terrain will affect asset(s) or mission. [Visualization]	

Consider Effects of Terrain

1	2	3	4	5
		(J) Speculates about how terrain features may offer advantages to enemy.	(J) Identifies information needed about terrain, for example, features or conditions that must be identified during planning due to implications for mission (e.g., mosques, nature of a road).	
		(K) Makes predictions either generally or specifically about enemy use of terrain.		
		(L) Makes specific statements about how to leverage terrain advantages (e.g., "Can I use the forest to protect my forces from observation?" or "Can I obscure the enemy's vision with smoke?")		
		(M) Describes route features required based on assets used or mission tasks.		

1	2	Consider Effects of Terrain 3	4	5
		(N) Identifies terrain features that are advantageous for enemy.		

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Appendix A

Sample Tactical Vignette with Verbal Protocol

VIGNETTE 7: Enable Humanitarian Operations

<Slide 1>
NARRATOR:

The Task Force Commander has assigned your team to escort a group of trucks belonging to several non-governmental and private volunteer organizations to the Khahaly distribution center. As part of trying to reinforce the authority of the central government, a host nation platoon has been assigned to assist in the escort and security tasks. Speed is important for this convoy since the supplies are critically needed. Every truck is also vital since they have been loaded with single commodities.

<Slide 2>

There have been occasional reports of paramilitary groups operating illegal checkpoints on the road. In the last week, no patrols have found any evidence of these checkpoints along Route Relief.

<Slide 3>
PLATOON LEADER:

"Black 6, this is White 1. The bridge up here is washed out about a kilometer past CP 37. Looks like it's pretty recent. The water is a little deep, but doesn't look too fast. I put squads out to the flanks and we found a bypass that the trucks can make. Request to take the first truck in line and send it through?"

Stopping Point #1

- What are the critical issues or facts to consider at this point?
- I know you don't have much information yet, so I'm just asking for speculation. How could the situation unfold with what you know now?
- What would be your biggest concern at this point? What would be your top priority?

Lower priority questions:

- Have you seen any situation like this before? Briefly describe.
- What other information do you want about this situation, if any? How would you get (element of information mentioned)?
- How would that information affect your understanding of the situation?

NARRATOR:

Passage of the trucks took extra time, but worked out without any becoming stuck. Just as you get into the ceasefire boundary line area, you come across a large washout jammed with trees pulled up by the roots that has choked the river almost closed. The riverbed behind is filling with water, but not very fast - the road is still high and dry and should stay so for at least a day.

You continue moving, watching the river. The lead platoon leader (White 1) halts the convoy and calls you forward. As you crest the hill where the platoon leader stopped, you see a large town virtually wiped out by a mining catch basin that has broken and water poured through the valley.

On entering the town you see the survivors still digging out of the water, mud, and ruins. They rush to the trucks, wailing and screaming, thinking the supplies are for them. Many of the things in the trucks would be useful: shovels, blankets, clothing, food, water, basic cooking items, and tents. Some of the NGO/PVO truck drivers want to stop here and help. You are very conscious of the suffering the supplies are meant to take care of in Khahlay and being behind schedule.

Stopping Point #2

- At this point, what are the critical issues? Has this caused you to consider any other aspects of the situation?
- (If participant tries to call higher for guidance) Would you be making a recommendation to higher?
- What is your biggest worry or concern?
- With what you know, how do you think this situation could unfold?

Lower priority questions:

- Have you seen any situation like this before? Briefly describe.
- What other information do you want about this situation, if any? How would you get (element of information mentioned)?
- How would that information affect your understanding of the situation?

<Slide 4>

HOST NATION PLATOON LEADER (accented English):

"Not stopping here! No help! We GO NOW!"

VILLAGE ELDER (translated):

"He says: Praise the all Supreme One whose name we are not fit to pronounce! Our prayers have been answered! I called for help hours ago and you have arrived! What have you brought? How many men? We can still save some of the people who were buried in the mud! This way, this way!"

NARRATOR:

An attempt to call the Task Force to alert them to the crisis here is unsuccessful due to the steeply sided, narrow valley you are in. It would take over 20 minutes to reach a position where the radio would be able to make contact.

Stopping Point #3

- At this point, what are you considering?
- What are you most concerned about? Why?
- How will this situation unfold? Why?
- Describe the rationale behind your course of action.
- With whom will you communicate and why?